

UNIVERSAL PUZZLE PIECE WITH CUSTOMIZABLE SURFACE

Background of the Invention

[0001] This invention relates to a customizable puzzle piece. More particularly, this invention
5 relates to a puzzle piece that provides utility to a user even when the puzzle piece is packaged by itself and does not include a portion of an overall puzzle image.

[0002] Puzzle pieces are well known in the art.
10 Traditional puzzle pieces provide utility by way of a game. More particularly, a traditional puzzle is made up of puzzle pieces that each have, on one surface, one portion of an overall puzzle image. In this manner, a user is challenged to put the pieces of the puzzle
15 (i.e., the individual portions of the overall puzzle image) together in order to form the overall puzzle image. To increase the complexity of the challenge, the pieces of a puzzle may be made to have smaller sizes and/or less recognizable differences in shape.
20 However, such traditional puzzle pieces are deficient because they do not provide a stand-alone utility to a user. In other words, a traditional puzzle piece only provides functionality by way of an overall puzzle

constructing game. It is therefore desirable to provide a puzzle piece with a stand-alone utility.

[0003] Traditional puzzles have been around for hundreds of years. Yet, the media in which puzzles
5 have been embodied have generally remained the same. More particularly, traditional puzzle pieces are commonly embodied in a type of cardboard or wood. It is therefore desirable to provide puzzle pieces that are realized in a variety of different media in order
10 to increase the utility provided to a user.

[0004] Traditional puzzle pieces are also inherently small (e.g., 1 square-inch). As noted above, puzzle pieces are fabricated in small sizes in order to increase the difficulty in completing the overall
15 puzzle game. Once the size of a traditional puzzle piece increases beyond a particular size (e.g., to the size of a traditional puzzle), the traditional puzzle piece loses utility with respect to a single user. It is therefore desirable to provide a puzzle piece
20 configuration that is larger than a traditional puzzle, but that still maintains a useful function.

Summary of the Invention

25 [0005] It is an object of the present invention to provide a puzzle piece that does not include a portion of an overall puzzle image, but that still provides utility to a user. More particularly, it is an object of the present invention to provide a puzzle piece with
30 at least one surface that may be customized by a user.

[0006] The puzzle piece may also include indicia that are representative of a theme or themes. In this manner, the puzzle piece may be packaged and

distributed individually to a user so that the user may, for example, draw an image related to the theme on the customizable surface. If multiple puzzle pieces are customized, then these puzzle pieces may be fit
5 together to form a unique overall puzzle image that is representative of the theme.

[0007] Puzzle pieces are also therefore provided that have a universal shape. A puzzle piece with a universal shape may mate with an identically shaped
10 puzzle piece on each side. Thus, an infinite number of identically shaped universal puzzle pieces may be interlocked to form an infinitely large puzzle.

[0008] The puzzle pieces of the present invention may be useful at an event having a theme. For example,
15 universal and customizable puzzle pieces of the present invention may be distributed to participants of a rally or other public event. One surface of the puzzle piece may be operable to be customized by a user while the reverse side may include indicia representative of the
20 theme of the rally or other public event. In order to allow a user to customize thoroughly the puzzle piece, the size of the puzzle piece may have a large dimension (e.g., one square-foot). Accordingly, each participant of the rally or other public event may configure a
25 puzzle piece and, at some point, put his or her puzzle piece together with others to form a unique puzzle representative of the theme. Due to the universal shape of the puzzle pieces, the puzzle would not have any defined borders and would, at any side, be operable
30 to accept additional universal puzzle pieces having the same universal shape. Therefore, at any time, a new user may customize a puzzle piece and easily attach the customized puzzle piece to the already existing puzzle.

[0009] Puzzle pieces are also provided in a virtual medium. Such virtual puzzle pieces may be accessible and customizable through the internet. A graphical user interface (GUI) may be provided to allow a user to
5 customize a virtual puzzle piece. Such virtual puzzle pieces may also have a universal shape. In so doing, the user may place a customized virtual puzzle piece in an existing virtual puzzle regardless of the number of virtual puzzle pieces already included in the puzzle.
10 An option that allows a user to upload a puzzle piece image and "paste" that uploaded image onto a virtual puzzle piece is also provided.

[0010] An electronic puzzle piece is also provided that allows a user to play back a previously recorded
15 audio segment. An option may be included that allows a user to record an audio segment.

[0011] The puzzle pieces of the present invention are also provided in a variety of embodiments and media. Such embodiments include, by way of example,
20 stickers, punch-out cards, trading cards and pads. Additionally, the customizable area of a puzzle piece may be configured to accept a variety of types of user customizations. For example, the customizable area may be fabricated out of canvas so that a user may paint an
25 image onto the puzzle piece.

Brief Descriptions of the Drawings

[0012] The above and other features of the present
30 invention, its nature and various advantages will be more apparent upon consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which like reference

characters refer to like parts throughout, and in which:

[0013] FIGS. 1A-1C are illustrations of universal puzzle pieces constructed in accordance with the principles of the present invention;

[0014] FIG. 2 is an illustration of a universal puzzle piece with indicia representative of a theme constructed in accordance with the principles of the present invention;

10 [0015] FIG. 3 is an illustration of a universal puzzle piece with a customizable area constructed in accordance with the principles of the present invention;

[0016] FIG. 4 is an illustration of a pad including multiple universal puzzle pieces constructed in accordance with the principles of the present invention;

[0017] FIG. 5 is an illustration of a GUI including a virtual universal puzzle piece and customization tools constructed in accordance with the principles of the present invention;

[0018] FIG. 6 is an illustration of a GUI including an puzzle piece submission feature constructed in accordance with the principles of the present invention;

[0019] FIGS. 7A is an illustration of a trading card puzzle piece with a customizable area for inclusion of, for example, an autograph constructed in accordance with the principles of the present invention;

30 [0020] FIGS. 7B is an illustration of a trading card puzzle piece constructed in accordance with the principles of the present invention;

[0021] FIG. 8 is an illustration of a sticker puzzle piece having a universal shape constructed in accordance with the principles of the present invention;

5 [0022] FIG. 9 is an illustration of a punch-out universal puzzle piece constructed in accordance with the principles of the present invention;

[0023] FIG. 10 is an illustration of an electronic universal puzzle piece constructed in accordance with
10 the principles of the present invention;

[0024] FIG. 11A is a network topology for implementing the GUIs of FIGS. 5 and 6 constructed in accordance with the principles of the present invention; and

15 [0025] FIG. 11B is a network topology for implementing the electronic puzzle piece of FIG. 10.

Detailed Description

20 [0026] FIG. 1A shows universal puzzle piece 100 that includes puzzle piece 101 with a symmetrical shape and an even number of male and female connectors. Due to the universal shape of puzzle piece 101, an infinite number of puzzle pieces 101 may lock together to form a
25 puzzle. This puzzle would have borders that are operable to receive (i.e., interlock with) additional universal puzzle pieces 101. Puzzle 110 is one embodiment of such a puzzle and is constructed from universal puzzle pieces 111-113. The symmetrical
30 nature of puzzle piece 101, however, leads to the rotation of particular puzzle pieces (e.g., the layout of puzzle piece 112 is rotated 90° when compared to the

layout of puzzle pieces 111 and 113) when constructing puzzle 110.

[0027] FIG. 1B shows universal puzzle piece 130 that includes puzzle piece 131 with a non-symmetrical universal shape such that a duplicate of puzzle piece 131 may mate with any side of the original puzzle piece 131. As a result of the non-symmetrical shape, puzzle piece 131 does not have to be rotated in order to mate with any side of an identically shaped puzzle piece. Puzzle 140 includes non-symmetrical universal puzzle pieces 141-144 that are not rotated with respect to one another. As a result of the similar orientation of puzzle pieces 141-144, a user may customize a puzzle piece with respect to the same axis and not worry about having this axis rotated during the construction of puzzle 140.

[0028] FIG. 1C shows universal puzzle piece 160 that includes puzzle piece 161 with both female connector 162 and male connector 163 on each side. By including two connectors on each side, the strength of the interlocking bond (connection strength) between puzzle piece 161 and a similarly shaped puzzle piece is increased with respect to a puzzle piece having a single connector of comparable size on each side. Thus, the size of connectors 163 and 162 may be decreased and still provide a needed amount of connection strength. In decreasing the size of male connectors 163 and female connectors 162, the size of the customizable area (not shown) on puzzle piece 161 increases. In this manner, the size of the customizable area (not shown) may be increased as additional connectors are included on puzzle piece 161.

[0029] Puzzle piece 161 is non-symmetrical and may be included in a puzzle of similarly shaped puzzle pieces. Puzzle piece 170 includes puzzle pieces 171-174 and 176-179 that have the same universal
5 shape as puzzle piece 161. Due to the universal nature of puzzle pieces 171-174 and 176-179, additional puzzle pieces 161 may be added to puzzle 170.

[0030] Turning now to FIG. 2, themed puzzle piece 200 is shown that includes surface 201 with
10 indicia 202-204 that relate to the same theme. Center-oriented indicium 202 may be excluded from puzzle piece 200 such that the center of puzzle piece 201 may be customized by a user. Indicia 203 and 204 are included on the male connectors of puzzle piece 201 to
15 increase the size of such a customizable area while providing representations of the theme.

[0031] One embodiment of a possible reverse (i.e., rear) surface of puzzle piece 201 is shown in puzzle piece 300 of FIG. 3. As will be discussed later in
20 connection with the discussion of FIG. 4, surface 301 may be entirely customizable to a user or may include only portion 302 that is customizable to a user. Preferably, surface 301 does not contain any type of indicia. However, persons skilled in the art will
25 appreciate that indicia may be provided on surface 301 as, for example, a picture or descriptive text or placed on surface 301 as customizations made by the user. As per another example, an outline (not shown) of a picture that may be colored by a user may be
30 placed on surface 301. Depending on the area operable to receive user customizations, a user may add customizations (e.g., user-created indicia 303 and 304) to surface 301.

[0032] Persons skilled in the art will appreciate that, depending upon the material used for surfaces 301 and 302, a variety of customizations may be made to puzzle piece 300. Descriptive text may be included on
5 a particular side of a puzzle piece to denote the type of customization for which the material is intended. For example, if a canvas is used, then descriptive text may be included that notes that acrylic paints are the intended customization tool for the canvas. This
10 descriptive text is preferably included on the non-customizable side or area of puzzle piece 301.

[0033] However, as mentioned above, a puzzle piece constructed in accordance with the principles of the present invention may be operable to allow a user to
15 customize all surfaces. Materials employed as surface 301 (or as puzzle 300) may be, for example, cardboard, metal (e.g., bronze), stone, wood, aluminum, plastics (e.g., recycled plastics), plexiglass, acrylics, glass, whiteboard, canvas, felt or a fabric.
20 For example, a watercolor paper may be utilized in order to best receive watercolors. As per another example, Braille paper may be used such that a blind user may create Braille holes in puzzle piece 301. Alternatively still, a Braille painting paper may be
25 used such that a blind user may employ Braille paint to form paint blots having the configuration of a Braille letter.

[0034] Each puzzle piece 300 may be packaged individually. Such packaging may also include a card
30 or pamphlet associated with a theme or the operation of puzzle piece 300. The package may include one or more customization instruments (e.g., a pen, box of crayons, markers, paint brush and paint or Braille hole-maker).

In this manner, multiple puzzle pieces may be distributed to different users (e.g., a second grade class) such that each user may customize a puzzle piece that may ultimately be utilized in a puzzle.

5 [0035] FIG. 4 shows the construction of pad 400 that includes multiple puzzle pieces having the same universal shape. More particularly, pad 400 includes puzzle piece 401 and any additional number of puzzle pieces 402. Puzzle pieces 402 may be attached to
10 puzzle piece 401 via bindings 403 and 404 (e.g., glue or staples). To create pad 400, puzzle pieces 402 may be fixed onto puzzle piece 401 in accordance with directional arrows 406. Next, bindings 404 and 405 may be placed onto the group of puzzle pieces 401 and 402
15 to form a pad in accordance with direction arrows 405. Due to the nature of the shape of the universal puzzle piece shape depicted by pad 400, two bindings, bindings 403 and 404, are employed. However, a single binding may be used here (e.g., just binding 403) or in the
20 case of a differently shaped universal puzzle piece.

 [0036] Puzzle piece 401 may be constructed differently from puzzle pieces 402. For example, puzzle piece 401 may have construction 430 in order to increase the stiffness of, and thereby provide support
25 to, pad 400. Construction 430 may include inner cardboard layers 433 and 434, outer non-customizable layer 432 and customizable layer 431. Outer non-customizable layer 432 may be, for example, similar to surface 201 of FIG. 2, which, in turn, may include
30 indicia. A non-customizable surface is a surface that is not operable to receive the mark of a customization tool. Persons skilled in the art will appreciate that any surface may be marked. For example, a slab of

steel may be marked with a hammer and chisel.

Therefore, a customizable surface may be a surface that is operable to receive the mark of a customization tool without much effort. In some embodiments, the

5 customization surface is preferably constructed with a particular customization tool or group of customization tools in mind. An outline of a picture is a customizable layer because, although portions are non-customizable (i.e., the lines that form the outline),
10 substantial customizable portions still exist (i.e., the area inside of the lines). Similarly, a paper with a watermark is a customizable paper. Such a customizable portion is preferably a raw substrate (e.g., raw print paper) that has not yet been
15 customized (e.g., does not already have an image printed on it). Thus, layer 432 may be a layer of cardboard with a picture printed on it (e.g., a background with a company logo on it), while layer 431 may be a layer of raw cardboard.

20 **[0037]** A shorted layer 436 may be fixed (e.g., glued) to a non-customizable layer to create a customizable portion on construction 430. Alternatively, non-customizable layer 435 may be fixed to customizable layer 431 such that only a portion of
25 customizable layer 431 is provided to a user. One embodiment in which layers 435 and 436 may be utilized will be discussed further in connection with the trading cards of FIGS. 7A and 7B.

[0038] Puzzle piece 401 is preferably constructed
30 with multiple layers. Puzzle pieces 402, however, may each be constructed with a single layer. In one embodiment, puzzle pieces 402 may be fabricated from drawing paper in order to decrease the thickness of pad

400 and increase the number of puzzle pieces 402 that may be employed in pad 400. Such pages may include one or more surfaces with a watermark or other indicia related to a theme. One surface of puzzle piece 401
5 (e.g., the exterior surface) may also include indicia related to that same theme.

[0039] Persons skilled in the art will appreciate that pad 400 may provide a useful way to distribute puzzle pieces at an event or a promotion. For example,
10 the organizers of an event may construct pad 400 to include indicia representative of a theme of the event. During the event, organizers may remove puzzle pieces 402 from pad 400 one-by-one and distribute puzzle pieces 402 to the participants of the event.
15 Such participants may then customize the customizable surface of his or her puzzle piece 402. Customized puzzle pieces 402 may ultimately be interlocked to form a universal puzzle, which will have a unique look due to the wide-variety of individual puzzle piece
20 customizations.

[0040] Pad 400 may be manufactured and distributed as kit 420. Kit 420 may contain packaging 421, preferably constructed from a transparent polymer so that its contents may be easily viewed, and puzzle
25 pad 422. Puzzle pad 422 may alternatively be a single puzzle piece. A card or pamphlet may also be included in kit 420. Moreover, one or more customization instruments (e.g., crayon boxes) may be included in kit 420. The number of customization instruments in kit
30 420 may be equal to the number of puzzle pieces 402 or the total number of puzzle pieces 401 and 402.

[0041] FIG. 5 shows GUI 500 that is preferably embodied in a web-browser connected to the internet. A

web-server (not shown) may provide the tools and information utilized in GUI 500 as well as perform some or all of the operations requested by a user of GUI 500. This web-server (not shown) may also retrieve
5 information from and store information into a remote database or another type of storage device. Generally, GUI 500 allows for a customizable (e.g., blank) universal puzzle piece to be accessible and customizable through the internet. If implemented as a
10 web-browser, GUI 500 may include internet access and navigation tools 501 and 502. Persons skilled in the art will appreciate that GUI 500 may be employed in an environment that is not connected to the internet or world wide web. For example, an intranet may be set up
15 that includes multiple computers (not shown) that each have GUI 500 and may access a remote database (not shown) in order to deposit and retrieve puzzle information and tools. Alternatively, a single computer may have software that allows a user to
20 customize one or more virtual puzzle pieces, save the customized puzzle pieces (and any resultant puzzle) to the computer's hard-drive and print any customizable puzzle pieces (or puzzles) on a printer.

[0042] A user of GUI 500 may be recognized by any
25 associated login/password so that at least a portion (e.g., portion 504) may be customized to a user after login. Puzzle piece 511 is provided to a user. Tools 530 and color palette 520 may be included so that a user may customize puzzle piece 511 through GUI 500
30 and form customized indicia 550. The color pallet may include multiple colors 521-524 that, when selected by a user, change the color of the instrument being used to customize puzzle piece 511. Tools 530 may be

selectable by the user and may include, for example, cut, paste, copy, large brush, small brush, erase, spray paint, insert picture and zoom functionalities to a user.

5 **[0043]** Each virtual puzzle piece may be assigned a number or code and the number or code may be presented to a user via portion 505. This number or code may be utilized as the title for puzzle piece 511 and may be changed by the user to a descriptive title. The user
10 may store additional information with puzzle piece 511. For example, a user may store his or her name, city, state and comments on the overall theme that may be intended for puzzle piece 511. This information may be added through a GUI (not shown) that is accessed by
15 clicking on portion 505. Link 506 may be included so that, when selected by a user, it activates a GUI that includes an birds-eye view of the virtual puzzle already completed or, if too large, a portion of the already completed virtual puzzle. Link 507 may be
20 included and may allow a user to save and/or be provided a final review of puzzle piece 511. Link 508 may be included and, when selected, will save the puzzle piece 511 (or the image created on puzzle piece 511) to a remote database (not shown).

25 **[0044]** After the image is saved, link 508 may "call" a GUI in which a user may add puzzle piece 511 to the already existing puzzle, or link 508 may automatically add puzzle piece 511 to the puzzle and provide the user with a view of the puzzle or a portion of the puzzle
30 that contains puzzle piece 511. Users may also be provided with the option of uploading one or more pictures that may be formatted and applied to the virtual surface of puzzle piece 511. Furthermore,

users may be provided with the option to print any customized puzzle piece or the completed puzzle on a designated printer.

[0045] Persons skilled in the art will appreciate
5 that puzzle piece 511 does not have to have a universal shape. Additionally, puzzle piece 511 may not be customizable and may contain a portion of an overall puzzle piece image so that GUI 500 and GUI 600 of FIG. 6 provide a virtual game similar to the physical
10 game provided by a traditional puzzle.

[0046] FIG. 6 shows GUI 600 in which a user may place customized puzzle piece 607 puzzle 625. Puzzle markers 650 may be included in puzzle 625 to show a user positions into which customized puzzle piece 607
15 may be placed. Link 603 may be included to allow a user to go back to a GUI (e.g., GUI 500 of FIG. 5) and edit customized puzzle piece 607. Links 604 and 605 may be included in order to change the perspective in which puzzle 650 is presented to a user. For example
20 links 604 and 605 may zoom in, zoom out, scroll left, scroll right, scroll up or scroll down the portion of puzzle 650 presented to a user.

[0047] A virtual puzzle may lead to a useful product promotion 602. For example, a user may receive a
25 personal identification number (PIN) or code for each bar of candy that he or she buys. This PIN is associated with a puzzle piece. For example, after a PIN is entered, a transparent call may be made to a remote database to retrieve the puzzle piece, or
30 characteristics of the puzzle piece, associated to that PIN. Accordingly, the puzzle piece's identification may be that of a PIN or a sweepstakes identification code. As per one embodiment of a product promotion,

specific PIN may be associated with puzzle pieces having specific prizes, so that if PIN "2" is entered and puzzle piece "2" corresponds with a prize of a "BMW Roadster," then a puzzle piece may be presented to a user that depicts a "BMW Roadster." In such an instance, descriptive text may be presented to the user that explains to him or her the prize that was just won and may provide instructions on how to redeem or claim that prize. If no prize is won, a blank puzzle piece may be presented to a user. If the user customizes and submits this puzzle piece, the user may then be entered into a random drawing for a runner-up prize.

[0048] A puzzle piece may provide a unique medium in which trading cards may be sold, distributed or bundled together in trading card packs. FIG. 7A shows front surface 701 of a puzzle piece that includes picture 702 that may represent, for example, a sports personality. Portion 703 may be customizable and may receive or include a customized mark (e.g., an autograph). FIG. 7B shows rear surface 751 of a puzzle piece that includes indicia segment 752. Multiple puzzle pieces may then be put together to form puzzle 753. Although the puzzle pieces of FIGS. 7A and 7B need not have universal shapes, the puzzle pieces may be packaged in trading card packs associated with a specific sport. Thus, by fabricating the puzzle pieces of FIGS. 7A and 7B to have a universal shape, universal puzzle pieces having indicia of different sports may be interlocked with each other to form a unique multi-sport puzzle. Similarly, sets of universal puzzle piece trading cards may be expanded infinitely by the issuer.

[0049] FIG. 8 shows sticker 800 that is in the shape of a universal puzzle piece. Sticker 801 may include

two layers 803 and 802 where layer 802 may be peeled off of layer 803. Layer 802 may include front surface 801 which may be customizable to a user. Layer 803 may include indicia either on its reverse or
5 on the side covered by layer 802, such that these indicia appear when layer 802 is removed. Layer 802 and 803 may be affixed together through means of a temporary adhesive or by a static bond. The adhesive is preferably chosen such that layer 802 may be
10 securely re-fixed to a substrate. Layer 802 may, in turn, be constructed from multiple layers.

[0050] FIG. 9 illustrates punch-out puzzle piece 900 that includes support portion 901 and punch-out portion 902. Punch-out portion 902 preferably has a universal
15 shape and may be customized (e.g., blank on one side) or both sides. Indicia, such as descriptive text, may be present on support portion 901. Punch-out puzzle piece 900 provides a simple structure to individually package and house punch-out portion 902 via support
20 portion 901. Punch-out puzzle piece 900 may be any size (e.g., the size of a business card).

[0051] Persons skilled in the art will appreciate that punch-out puzzle piece 900 may also be used to sell a traditional puzzle in a puzzle pad where the
25 puzzle pieces are of varying shapes. Doing so would remove the need for traditional puzzle boxes that take up valuable shelf space in stores. Thus, different non-universal puzzle pieces may be packaged in one pad (e.g., in package 420 of FIG. 4 as pad 420) and may be
30 operable to form, for example, a non-universal puzzle. In this manner, a puzzle in a pad is provided.

[0052] Turning now to FIG. 10, electronic puzzle piece 1000 is shown having universal shape 1001.

Puzzle piece 1000 may include one or more customizable surfaces. Moreover, puzzle piece 1000 may contain electronic circuitry 1002 that may retrieve stored information. For example, audio data may be stored in
5 electronic circuitry 1002. This audio data may be retrievable by a user through controls 1003 (e.g., one or more buttons) and outputted to that user by speaker 1004. If video data is stored in electronic circuitry 1002, then display 1005 may also be included.
10 Furthermore, puzzle piece 1001 may include an audio recorder so that a user may store, save and retrieve an audio segment. In this manner, a user may store a short speech about a particular theme on electronic circuitry 1002. In turn, this stored speech may be
15 replayed to any user via controls 1003.

[0053] FIG. 11A shows network topology 1100 for use by GUI 500 of FIG. 5 and GUI 600 of FIG. 6. Network topology 1100 includes personal computer 1010 on which a GUI is displayed to a user. Web-server 1020 may be
20 included to publish information from remote database 1030 to a website accessible by personal computer 1010. Web-server 1020 may also store data provided by personal computer 1010 to remote database 1030.

25 [0054] FIG. 11B shows electronic circuitry topology 1150 that may be utilized as a topology for control circuitry 1002 of FIG. 10. Topology 1150 includes input device 1051 that may be, for example, a button, speaker or image capture device. Output device
30 1053 may be included and may be, for example, one or more speakers and/or displays. Persons skilled in the art will appreciate that a single speaker may be utilized as both an input and output device. Media

processing circuitry may be included in order to
configure data so that it is playable by output
device 1053. Memory 1054 may be included to store
information such as, for example, audio segments, video
5 segments and still images. Control circuitry 1052 may
be, for example, a microprocessor an analog circuit
that controls the data-flow between the electrical
components of topology 1150.

[0055] From the foregoing description, persons
10 skilled in the art will recognize that this invention
generally relates to universal and customizable puzzle
pieces. It should be recognized that the invention may
take many forms other than those disclosed in this
specification. For example, electronic puzzle
15 piece 1000 of FIG. 10 may be employed as puzzle
piece 401 of pad 400. Accordingly, it is emphasized
that the invention is not limited to the disclosed
assemblies and methods, but is intended to include
variations to and modifications therefrom which are
20 within the spirit of the following claims.